ATTENUATION NETWORK

SPEC 12851 - 1

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Attenuator Network Instruction Manual

Shallco Attenuation Network: Spec 12851-1

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Description:

Shallco Attenuator Network Spec 12851-1 is a 600 ohm impedance, decade type, unbalanced "T" circuit direct reading unit providing accurate performance in the low radio frequency spectrum, and usable over the range from 0 to 10 megahertz. Accuracy +/- (.5% + .03 dB) of setting when checked at 1 kHz.

Features include individually shielded decades, wide attenuation range, and the use of non-inductive resistors. Frequency discrimination and stray capacitance are minimized through precision design. Silver alloy in switch blades and contacts guarantee almost indefinite reliable operation.

This unit has a standard input and output impedance of 600 ohms, with a range of 0 - 110 dB in 1 dB steps and is equipped with 3/4" spacing 5-way binding posts.

It is a portable, ruggedly constructed unit, housed in an attractive all metal cabinet, with positive detent action and mechanical stops incorporated into each decade.

Application:

Shallco Spec 12851-1 attenuation networks are general purpose instruments for use in laboratories, quality control departments and test facilities and are particularly useful in performing accurate measurements of gain or loss in filters, transformers, amplifiers, and other electronic equipment.

Physical:

This unit is has two decade attenuators housed in a two tone, blue and white cabinet which measures approximately 5-5/8" X 12-1/8" X 8-3/8". (See appendix outline drawing)

Theory of Operation:

Schematic and wiring diagram are shown for this unit in the appendix.

The input terminals of the network are connected through two attenuation controls to the output terminals. Two dials located on the front of the cabinet control the amount of attenuation from input to output. The left hand dial is a 10 step, 10 dB per step, 100 dB total decade. The right hand dial is a 10 step, 1 dB per step, 10 dB decade.

Operating Instruction:

The Shallco Spec 12851-1 attenuator network provides direct reading of attenuation when installed in a 600 ohm circuit. The sum of the dial readings is the attenuation inserted into the circuit. Clockwise rotation of the dials increases the attenuation to a maximum of 110 dB. The "C" and "G" terminals are provided as additional common or ground connections (See appendix outline drawing)

Cleaning and Lubrication

It is recommended that the following steps be performed at 180 day intervals. Disassemble the attenuation network by

removing the four front panel screws and sliding the electrical assembly from the case. Remove the rear cover of each individual decade attenuator by pressing on the locking tab located on the side of each unit and rotating the cover clockwise while pulling the cover to the rear. This will expose the contacts and the wiper arms.

a) Remove darkened grease or dark stains by using a soft lintless cloth or a grip free eraser.

b) Wash off residue using 97 proof denatured alcohol and dry with a lintless cloth.

c) Lubricate using a thin film of Mil-G-3278 grease or ASU Supermil Grease No. 06752, Mill-G-25760-A.

d) Rotate blades several times to distribute film.

e) Reassemble the attenuator and replace the network assembly into the case and replace screws

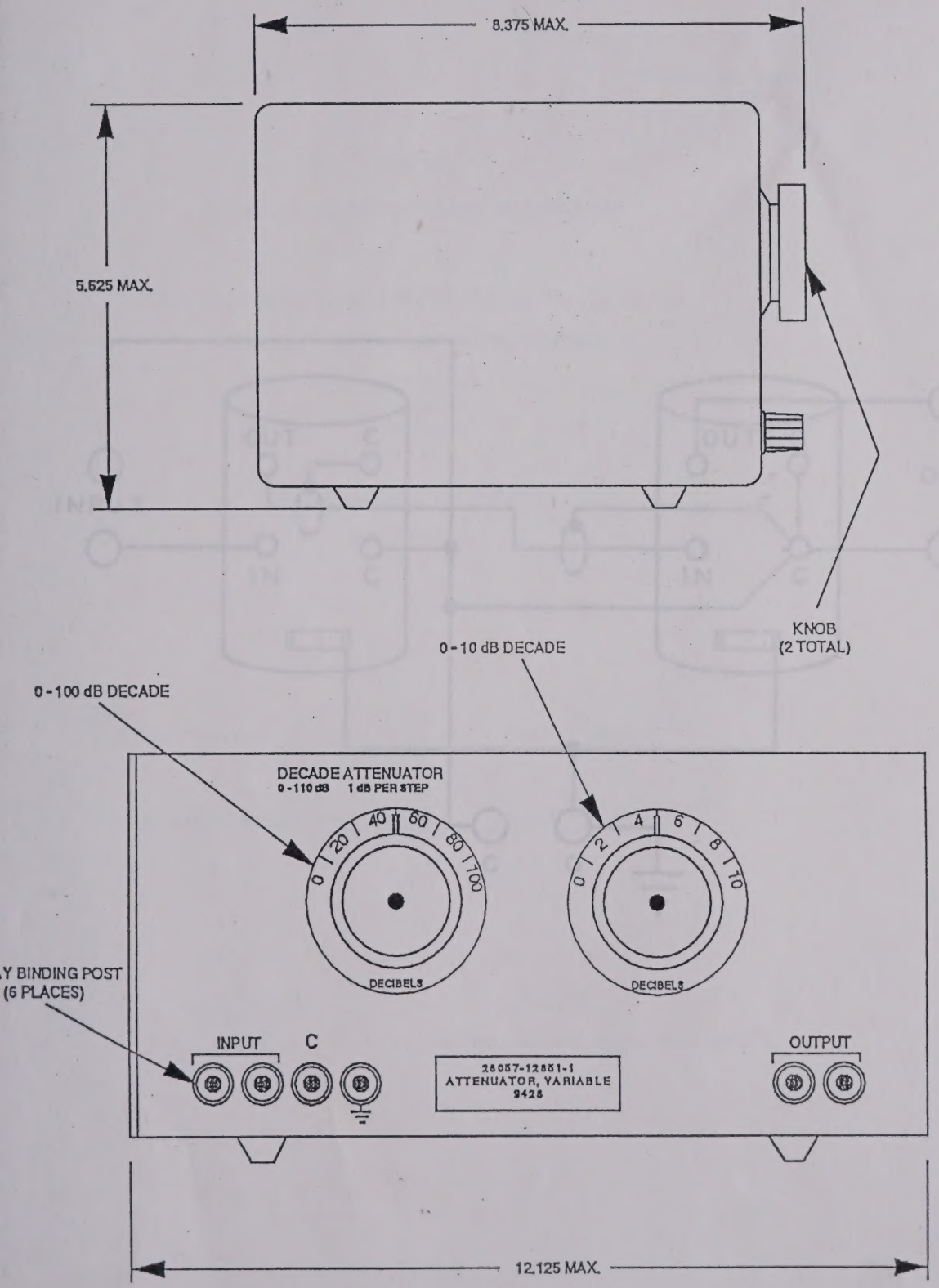
Replacement Parts

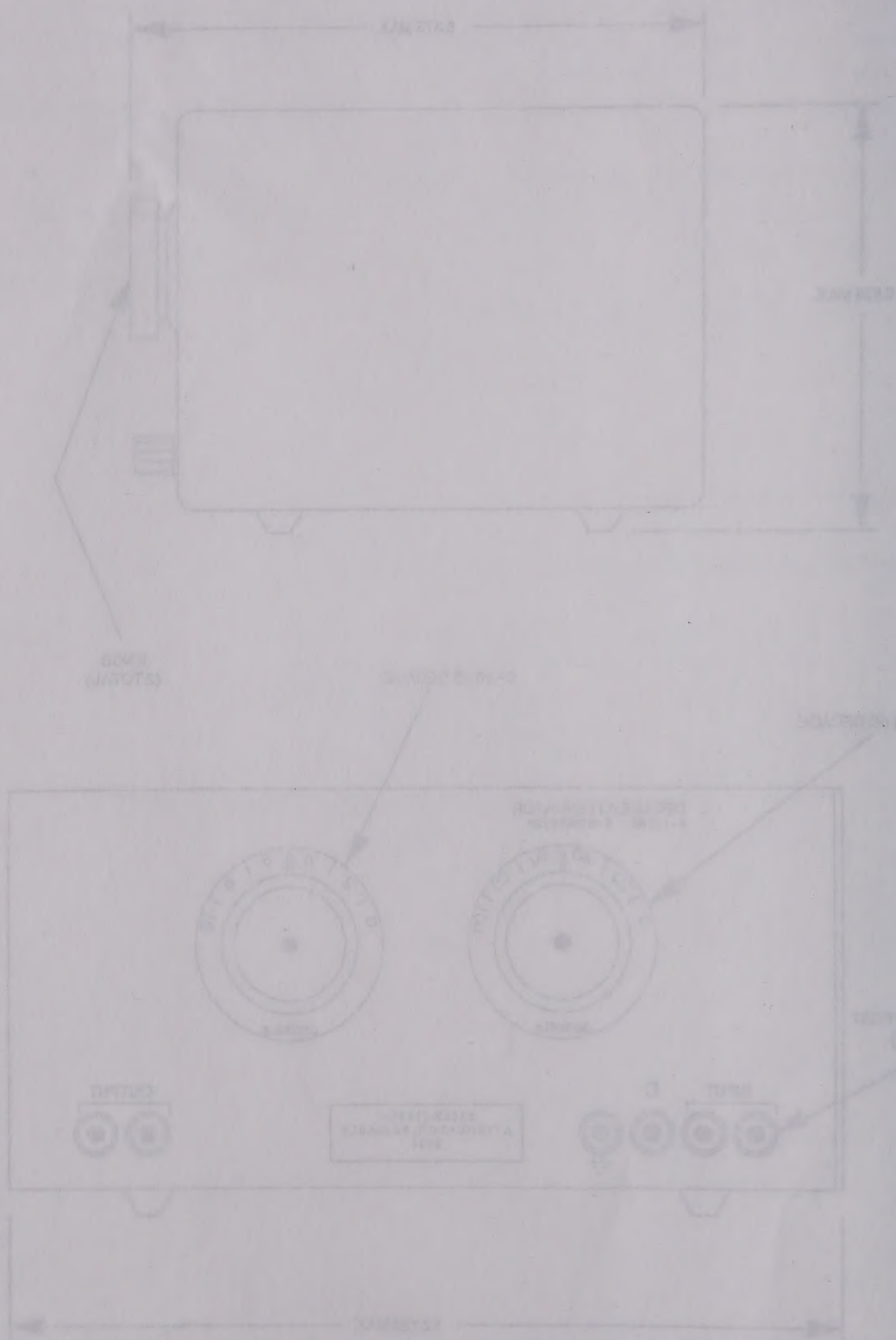
A listing of replacement parts is shown below:

Part Number	Description	Quantity per Unit
VT-1791G	Attenuator, 1 to 10 dB	1
VT-1792G	Attenuator, 10 to 100 dB	1
2839-72-2	Dial, 0 to 10 dB	1
2839-72-3	Dial, 0 to 100 dB	1
459	Binding Post, (Specify Black or Red)	6 total
182594-001	Knob and Skirt	2
PVC201	Capacitor	1
1422-16	Case	1
2839-70-1	Front Panel	

Appendix:

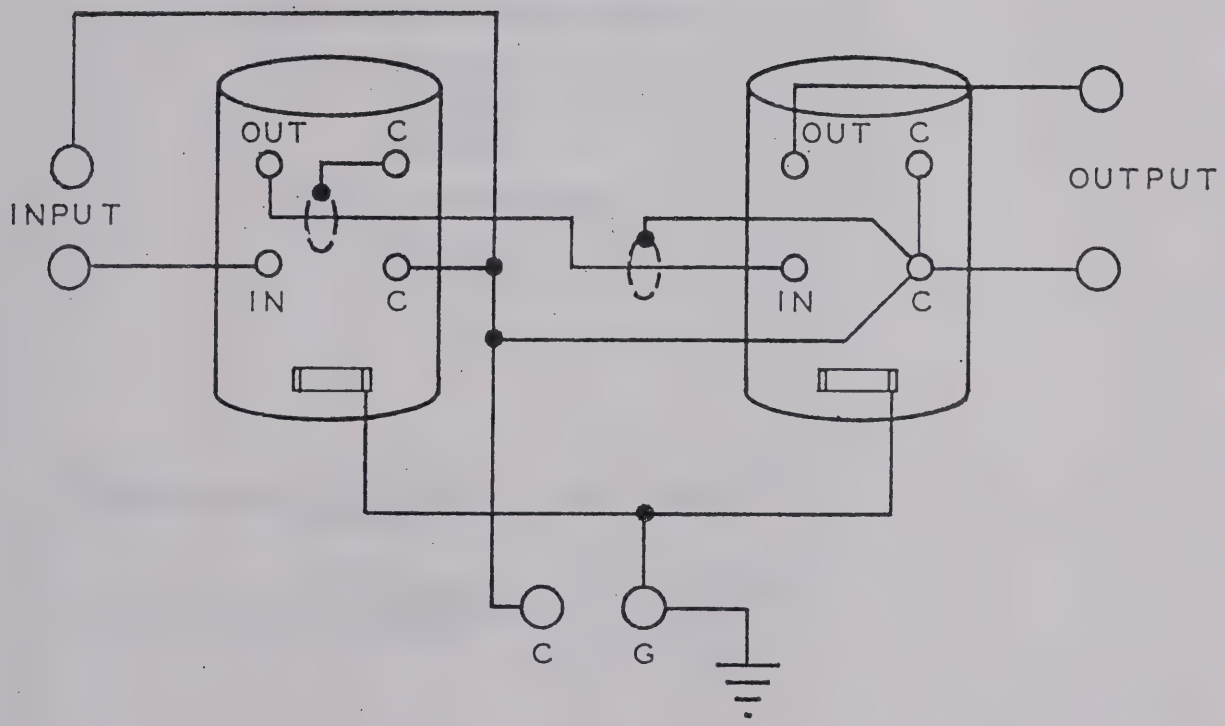
Spec 12851-1 Outline Drawing





Appendix:

Spec 12851-1 Wiring/Schematic Diagram



Appendix:

Calibration Procedure

STP 132

SHALLCO TEST PROCEDURE NUMBER 132

FINAL INSPECTION AND CALIBRATION PROCEDURE FOR

SHALLCO AND DAVEN PART NUMBERS:

VT-790G
VH-790G
VT-795G
VH-795G

AND SHALLCO PART NUMBER:

SPEC 12851-1

Quality Assurance: Glen Belnap Date: 4 MAY 95
Glen Belnap

Engineering Approval: P. Dorman Date: 4-May-95
Paul Dorman

Rev	Approval Date	Changes
-	14 July 94	-
A	4 May 95	Grammatical and appearance updates.

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1.0 INTRODUCTION AND DESCRIPTION

1.1 This procedure describes the calibration procedure for the Shallco (Daven) VH-790G, VT-790G, VH-795G, VT-795G, and the Spec 12851-1 Decade Network Attenuators.

1.2 This procedure includes tests of essential performance parameters only (electrical characteristics). Any malfunction noticed during calibration, whether specifically tested for or not, should be corrected.

Table 1 Calibration Description

Test Instrument Characteristics	Performance Specifications	Test Method
VH-790G & VT-790G		
Attenuation	Range: 0 to 110 dB Steps: 1-dB step Tolerance: +/-0.5% + 0.03 dB of setting.	The 1-dB steps are calibrated by applying a 10 V reference, and measuring the voltage drop. The 10-dB steps are calibrated by establishing a reference indication on a SWR meter with a 10 V input to the test instrument. The TI attenuation is then increased in 10-dB steps and the SWR meter is adjusted to regain the reference indication.
Impedance	600 Ohms	Not tested.
Frequency	Range: 0 to 10 MHz	Not tested. Note: Calibration performed at 1 kHz.
Decades	Two: 0 to 10 in 1-dB steps and 0 to 100 in 10-dB steps.	Each step in each decade measured.
Power	Input: 0.6 Watt max.	Not tested.

Test Instrument Characteristics	Performance Specifications	Test Method
VH-795G & VT-795G		
Attenuation	Range: 0 to 111 dB Steps: 0.1-dB step Tolerance: +/- 0.5% + 0.03 dB of setting.	The 0.1 and 1-dB steps are calibrated by applying a 10 V reference, and measuring the voltage drop. The 10-dB steps are calibrated by establishing a reference indication on a SWR meter with a 10 V input to the test instrument. The TI attenuation is then increased in 10-dB steps and the SWR meter is adjusted to regain the reference indication.
Impedance	600 Ohms	Not tested.
Frequency	Range: 0 to 10 MHz	Not tested. Note: Calibration performed at 1 kHz.
Decades	Three: 0 to 1.0 in 0.1-dB steps and 0 to 1 in 1-dB steps and 0 to 100 in 10-dB steps.	Each step in each decade measured.
Power	Input: 0.6 Watt max.	Not tested.
SPEC 12851-1		
Attenuation	Range: 0 to 110 dB Steps: 1-dB step Tolerance: +/- 0.5% + 0.03 dB of setting.	The 1-dB steps are calibrated by applying a 10 V reference, and measuring the voltage drop. The 10-dB steps are calibrated by establishing a reference indication on a SWR meter with a 10 V input to the test instrument. The TI attenuation is then increased in 10-dB steps and the SWR meter is adjusted to regain the reference indication.

Test Instrument Characteristics	Performance Specifications	Test Method
Impedance	600 Ohms	Not tested.
Frequency	Range: 0 to 10 MHz	Not tested. Note: Calibration performed at 1 kHz.
Decades	Two: 0 to 10 in 1-dB steps and 0 to 100 in 10-dB steps.	Each step in each decade measured.
Power	Input: 1.0 Watt max.	Not tested.

2.0 EQUIPMENT REQUIRED--all equipment must bear evidence of current calibration. Substitute equipment may be used provided that it is equivalent to all equipment listed.

2.1 AC Source--Hewlett Packard Audio Oscillator Model 201CR, Frequency : 1 kHz, Range: 0.3 to 10 Vrms.

2.2 SWR Meter--Hewlett Packard 415E, Input Frequency 1 kHz.

2.3 Digital Multi-Meter--Fluke 8050A.

2.4 Digital Multi-Meter--Simpson 454.

2.5 Ratio Transformer--Gertsch DBR-1 (0 to 111 dB).

2.6 Resistive Load--Local supply, Resistance: 600 Ohms, Power Rating: 1 Watt.

2.7 Coaxial cables, adapters, etc.--Local supply, as required for interconnection.

3.0 PRELIMINARY OPERATIONS

3.1 Ensure that all power switches are set to the "OFF" position. Set all auxiliary equipment controls as necessary to prevent damage to the equipment and so that dangerous voltages will not be present on the output terminals when power switches are turned on.

3.2 Connect the auxiliary equipment to the appropriate power source.

3.3 Turn all power switches to the "ON" position and allow sufficient warm-up time for the equipment.

CAUTION:
DO NOT ALLOW THE VOLTAGE LEVEL AT THE TEST INSTRUMENT INPUT TO EXCEED 18 VOLTS (0.6 WATTS); OTHERWISE THE TEST INSTRUMENT MAY BE DAMAGED.

4.0 **CALIBRATION PROCESS**--Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met.

4.1 Attenuation tests for the 0.1-dB/step and the 1-dB/step decades.

4.1.1 Set the AC source controls for 1 kHz and minimum output voltage.

4.1.2 Connect the equipment as shown in Figure 1.

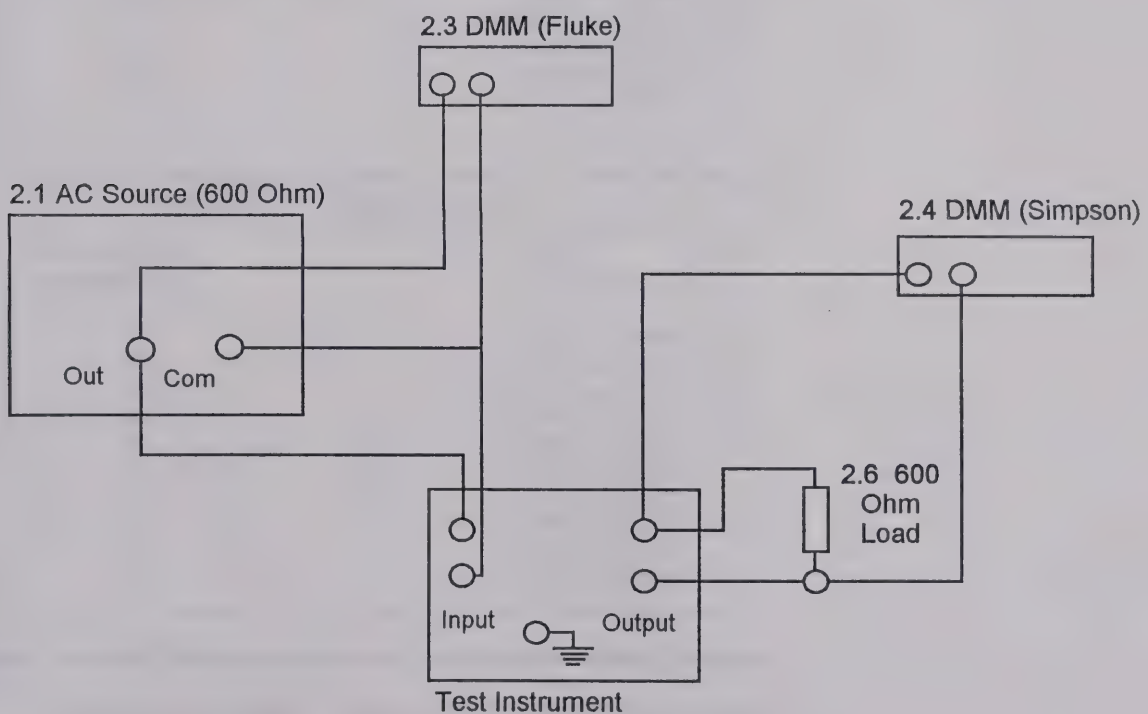


Figure 1. Low Attenuation Test Setup

4.1.3 Set each Test Instrument decade switch to 0 (zero).

4.1.4 Adjust the controls of the AC Source for 10.000 Vrms as indicated on the Fluke DMM.

4.1.5 Set the Test Instrument decade switches to each position listed in Tables 2 and 3, as applicable and verify that the DMM indicates within the tolerance limits in the tables below.

Note: Decades not currently being tested should be set to 0 (zero).

Table 2 Shallco (Daven) VH-795G and VT-795G 0.1-dB/step Tolerances

Test Instrument Decade Setting	DMM Indication (Vrms)
1	9.851 to 9.920
2	9.738 to 9.807
3	9.626 to 9.696
4	9.515 to 9.585
5	9.405 to 9.476
6	9.297 to 9.368
7	9.190 to 9.261
8	9.084 to 9.156
9	8.980 to 9.052
10	8.877 to 8.948

Table 3 Shallco (Daven) VH-790G, VT-790G, VT-795G, VH-795G and Spec 12851-1 1-dB/step Tolerances

Test Instrument Decade Setting	DMM Indication (Vrms)
1	8.877 to 8.948
2	7.907 to 7.980
3	7.043 to 7.116
4	6.273 to 6.346
5	5.588 to 5.659
6	4.977 to 5.047
7	4.434 to 4.500
8	3.949 to 4.013
9	3.518 to 3.579
10	3.133 to 3.192

Note: To convert these numbers to a dB figure use the following formula

dB = 20 log (Vin / Vout) where Vin = 10 V, Vout = DMM Indication

4.1.6 Set AC source for minimum output and disconnect the DMM from the TI, but leave the other equipment connected in the test setup.

4.2 Attenuation Test for 10-dB/step decade.

4.2.1 Connect the equipment as shown by the solid lines in Figure 2.

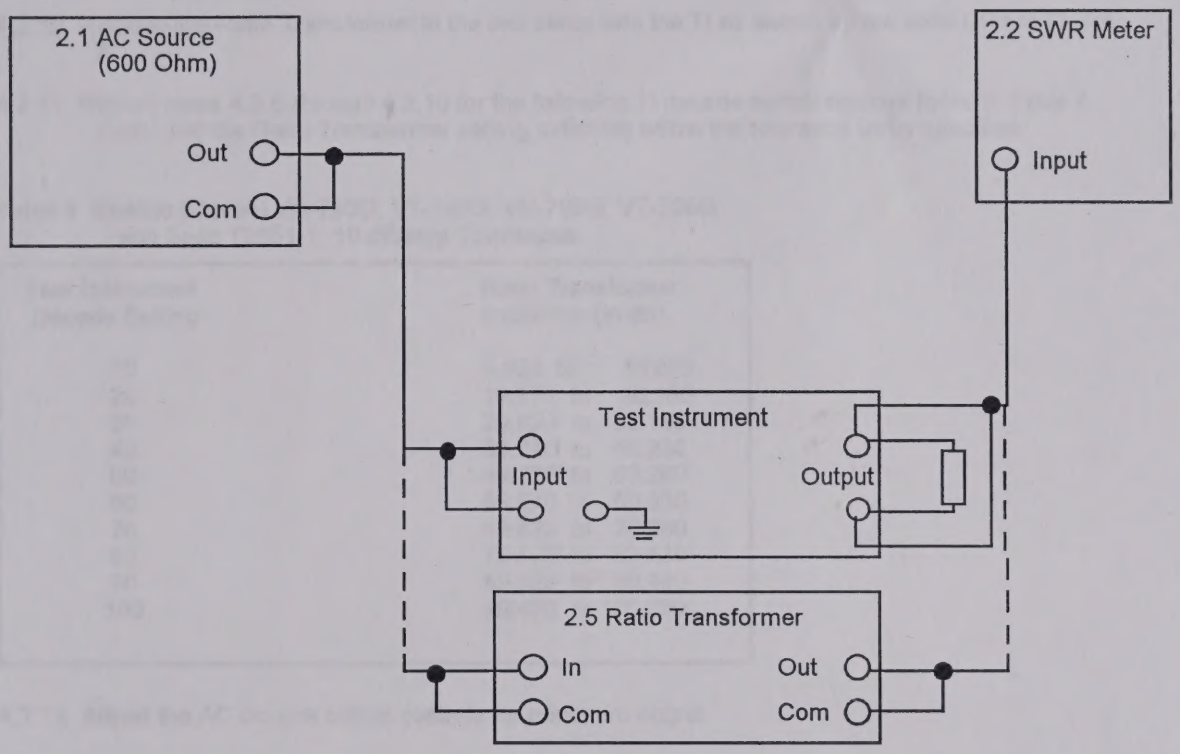


Figure 2. High Attenuation Test Setup

4.2.2 Set each TI switch to 0 (zero).

4.2.3 Adjust the controls for the AC source for 10.000 Vrms output at 1 kHz.

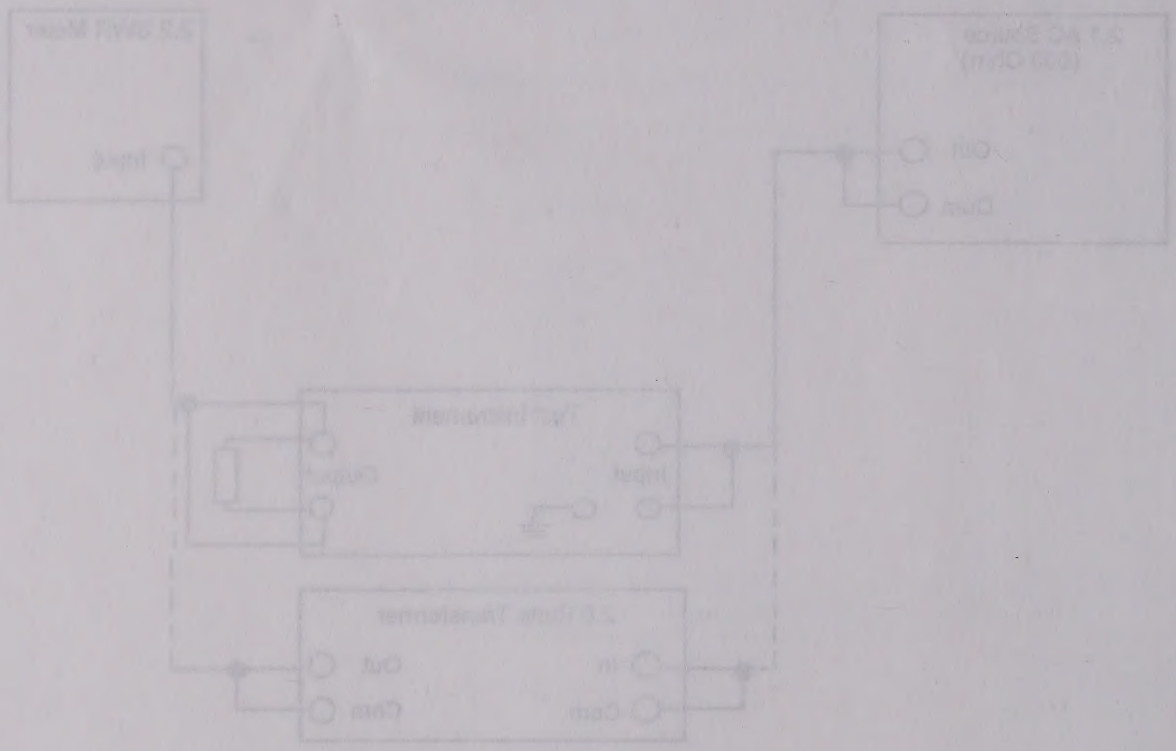
4.2.4 Set the SWR meter controls for a high-impedance, crystal input, and the range and gain controls for and expanded SWR meter indication.

4.2.5 Adjust the frequency controls of the SWR meter for a maximum indication of the SWR meter.

4.2.6 Set the TI 10-dB/step decade switch to 10.

4.2.7 Adjust the SWR meter range and gain controls for a reference indication. Note the SWR meter reference indication.

4.2.8 Replace the TI in the test setup with the Ratio Transformer as shown by the dashed lines in Figure 2.



4.2.9 Adjust the Ratio Transformer decade dials to obtain the SWR meter reference indication noted in step 4.2.7, and verify the ratio transformer setting.

4.2.10 Replace the Ratio Transformer in the test setup with the TI as shown by the solid lines in Figure 2.

4.2.11 Repeat steps 4.2.6 through 4.2.10 for the following TI decade switch settings listed in Table 4. Verify that the Ratio Transformer setting indicates within the tolerance limits specified.

Table 4 Shallco (Daven) VH-790G, VT-790G, VH-795G, VT-795G and Spec 12851-1 10-dB/step Tolerances

Test Instrument Decade Setting	Ratio Transformer Indication (in dB)
10	9.920 to 10.080
20	19.870 to 20.130
30	29.820 to 30.180
40	39.770 to 40.230
50	49.720 to 50.280
60	59.670 to 60.330
70	69.620 to 70.380
80	79.570 to 80.430
90	89.520 to 90.480
100	99.470 to 100.530

4.2.12 Adjust the AC Source output controls for minimum output.

4.2.13 Unless other measurements are to be performed, turn all power switches to the "OFF" position or the standby mode and disconnect the Test Instrument.

4.2.14 A Calibration sticker, if required, shall be placed on the unit indicating the company (Shallco, Inc.), the date the unit was calibrated, the date the unit is due for recalibration (one year maximum), and the technician performing the calibration.